

directly neutralizing the cell poisons may yet be discovered with the increasing facilities generously being devoted to medical research. On this rests the hope of an efficient therapy to supplement all other means of prevention and cure.

THE CAMMIDGE REACTION IN EXPERIMENTAL PANCREATITIS.¹

By JOHN SPEESE, M.D., AND EDWARD H. GOODMAN, M.D.,
OF PHILADELPHIA.

(A preliminary report, from the William Pepper Clinical Laboratory of the University of Pennsylvania and the Private Laboratory of Dr. John H. Musser, Philadelphia.)

It is rather surprising that, despite the great clinical value claimed for his test, Cammidge² has so far made no attempt to control his observations by experimental work. Eichler³ studied the effect of experimental pancreatitis on the urine, producing in one dog hemorrhagic pancreatitis, and in two dogs a diffuse purulent pancreatitis. The urines of these dogs before operation were negative, confirming the observation previously made that the urine of normal men, dogs, and rabbits does not give a positive pancreatic reaction. The post-operative examination of the urine, in each instance, was positive, which led Eichler to conclude that the test is of great value in diagnosing pancreatic disease. As he used the *A* and *B* reactions in his studies, and as these reactions have been severely criticised by Ham and Cleland,⁴ Schroeder,⁵ Gruner,⁶ Wilcox,⁷ and Haldane,⁸ the value of Eichler's conclusions may be questioned.

In 1907 Cammidge⁹ described a third, or *C* reaction, which he claimed does away with many objections raised by his critics. Very little clinical work has been done with the *C* test, apart from Cammidge's own researches, and, so far, no experimental work has been reported. The papers of Cammidge, Schroeder,¹⁰ and Goodman¹¹ have presented so much clinical evidence in favor of the reactions that we deemed it advisable to control these observations by experimentation.

¹ Read at a meeting of the College of Physicians of Philadelphia, December 2, 1908.

² Robson and Cammidge, *The Pancreas: Its Surgery and Pathology*, 1908.

³ Berl. klin. Woch., 1907, p. 769.

⁴ Australasian Medical Gazette, 1904, p. 399; *Lancet*, 1904, i, 1378.

⁵ Amer. Med., 1904, p. 406.

⁶ *Lancet*, 1904, i, 1459.

⁷ *Lancet*, 1904, ii, 211.

⁸ Edin. Med. Jour., 1906, [xx], 418.

⁹ Loc. cit., p. 252.

¹⁰ Jour. Amer. Med. Assoc., 1908, ii, 837.

¹¹ Read by invitation at a meeting of the Philadelphia Academy of Surgery, November 2, 1908, and to be published in the *Annals of Surgery*, February, 1909.

During a study of experimental pancreatitis conducted by Sailer and Speese,¹² the examination of the urine for the Cammidge reaction was productive of such interesting results that we were led to a systematic study of this phase of the question.

In five dogs 10 to 30 c.c. of cottonseed oil was injected into the pancreatic duct, a procedure which causes rapid necrosis of the pancreas. In three of these cases, studies were made of the urine before and after operation, and in two cases the examination before operation was omitted. The dogs were killed eight hours after the operation.

CASE I.—The urine before operation was not examined. The urine after operation gave a positive reaction. Macroscopic examination of the pancreas showed a diffuse necrotic process which involved most of the organ. The microscopic study revealed complete destruction of the tissue.

CASE II.—The urine before operation was negative; the urine after operation was negative. The pathological examination of the pancreas showed neither macroscopic nor microscopic lesions. In this case pancreatitis was not produced, owing to the attempt to inject oil into the pancreatic duct being unsuccessful.

CASE III.—The urine before operation was not examined; the urine after operation gave a positive reaction. The postmortem examination of the pancreas showed a diffuse necrotic process; lesions similar in nature were seen microscopically.

CASE IV.—The urine before operation was negative; the urine after operation gave a positive reaction. The macroscopic and microscopic study of the pancreas showed a diffuse necrotic process.

CASE V.—The urine before operation was negative; the urine the first hour after operation was negative; the urine the fourth hour after operation gave a positive reaction. The usual necrotic appearance following oil injections was seen; the microscopic examination failed to reveal any normal structure except in the tail of the pancreas. The animal in this case was killed four hours after operation.

Encouraged by these results, we thought it of interest to study the urine in cases of non-acute pancreatitis. Ligation of the pancreatic duct seemed to be the simplest method of producing such a lesion. The plan which we adopted in three instances was to examine the urine before ligation of the duct, and at the end of each twenty-four hours following the operation. After a positive reaction was obtained the animal was killed and the pancreas removed for microscopic study.

CASE VI.—The urine before operation was negative; the urine the first day after operation was negative; the urine the second day after operation gave a positive reaction; the urine the third day after operation gave a positive reaction; the urine the fourth day after

operation gave a positive reaction; and the urine the fifth day after operation gave a positive reaction. The dog was killed seven days after operation. An area of induration was found in the head of the pancreas, opposite the point of ligation. This lesion was the size of a large walnut, was distinctly hard, and cut with greater resistance than the remaining portions of the gland. Microscopic study of the indurated tissue showed a subacute inflammatory process, which had caused small areas of necrosis in the acini. A leukocytic infiltration, consisting for the most part of round cells, was seen in the stroma, and, to a less extent, about the acini. Proliferated connective tissue cells were also noted.

CASE VII.—The urine before operation was negative; the urine the first day after operation gave a positive reaction; and the urine the second day after operation gave a positive reaction. The dog was killed on the second day. The pancreas was indurated in an area about the size and shape of a hickory nut, the lesion being directly above the ligature which still surrounded the duct. Microscopic examination showed changes similar to Case VI, but not so extensive.

CASE VIII.—The urine before operation was negative; the urine fourteen hours after operation was negative; the urine the second day after operation was negative; the urine the third day after operation was negative; the urine the fourth day after operation was negative; the urine the fifth day after operation gave a positive reaction; and the urine the sixth day after operation gave a positive reaction. On the sixth day after operation an attempt was made to open the pancreatic duct at the point of ligation. This was unsuccessful on account of the induration about the duct. The first day following this procedure the urine was lost; on the second and third days the reaction was negative; on the third day typical crystals were found; and on the following day the animal died. The urine collected on this day up to the time of death gave a negative reaction. We are not prepared at this time to explain this phenomenon.

From the anatomical lesions produced by these experiments we inferred that a mechanical obstruction of the duct seems to be productive of a positive Cammidge reaction. This led us in Case VIII to attempt the removal of the obstruction caused by the ligature. Our purpose was to see if the reaction would disappear after the pancreatic duct again became patulous. As the reaction did not appear until the fifth day, and as by this time the induration was very marked, the attempt to pass a probe through the duct from its intestinal orifice was unsuccessful.

While not regarding the results of our experiments as conclusive, we believe them, nevertheless, to be very suggestive. Further research has been undertaken to determine the factors concerned in the production of the pancreatic reaction. The results of these studies will be published in our final report.